EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	461007	bone boney bony osseous$ osteo$ femur humerus spine spinal vertebra vertebral intervertebr$ intravertebr$	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 10:20
L2	74487	(reposition$ move moved moving adjust$3 adjustment angle angled or angling) near5 (tap tapp$3 bonetap$ drill$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 10:23
L3	1454331	(within inside in around) near3 (hole pilothole bore cavity recess opening aperture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 10:23
L4	34	l1 with l2 with l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 10:25

EAST Search History

L9	297	("0125642" | "0232851" | "0413178" | "0568932" | "0569896" | "0631572" | "0679693" | "0696902" | "0854956" | "1177344" | "1308798" | "1414060" | "1430951" | "1479325" | "1598726" | "1831813" | "20010000532" | "20020022847" | "20020042624" | "20020045896" | "20020058958" | "20020082606" | "20020091392" | "20020128655" | "20020156481" | "20020193780" | "20020193799" | "20030018335" | "20030018337" | "20030022132" | "20030040748" | "20030045880" | "20030055430" | "20030083667" | "20030105461" | "20030135213" | "20030153918" | "20040092947" | "20040102788" | "20040204717" | "20040210232" | "2192528" | "2231864" | "2294303" | "2308055" | "2338765" | "2344143" | "2402353" | "2409525" | "2414292" | "2494229" | "2525669" | "2526662" | "2608114" | "2710549" | "2792726" | "2794470" | "2833168" | "3065655" | "3083593" | "3216288" | "3320832" | "3336611" | "3540322" | "3620637" | "3682177" | "3835849" | "3867932" | "4005527" | "4019827" | "4039266" | "4059115" | "4115017" | "4138200" | "4142517" | "4273117" | "4319577" | "4341206" | "4362161" | "4388921" | "4450834" | "4456010" | "4491132" | "4521145" | "4528980" | "4549538" | "4600006" | "4605345" | "4649919" | "4699550" | "4705436" | "4710075" | "4730613" | "4750489" | "4821716" | "4830001" | "4877359" | "4884571" | "4904130" | "4969781" | "5026376" | "5066288" | "5071293" | "5078552" | "5122146" | "5129907" | "5133720" | "5147164" | "5147367" | "5171244" | "5180384" | "5180388" | "5190422" | "5190548" | "5207681" | "5207753"). PN. OR ("5222848" | "5228459" | "5228811" | "5350380" | "5354300" | "5364399" | "5374269" | "5374270" | "5382120" | "5382250" | "5383859" | "5387218" | "5409490" | "5409493" | "5423823" | "5423824" | "5423826" | "5429641" | "5437675" | "5437677" | "5447512" | "5465492" | "5486177" | "5509762" | "5520692" | "5527316" | "5536271" | "5549613" | "5562673" | "5573537" | "5575794" | "5578037" | "5607431" | "5624214" | "5630683" | "5649791" | "5653712" | "5658291" | "5667509" | "5669915" | "5681333" | "5700291" | "5713905" | "5735855" | "5741267" | "5743916" | "5746551" |	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/11 10:55

EAST Search History

L10	99	l1 and (l2 with l3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 10:59
L11	179	l1 same l2 same l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 10:59
L13	69	l9 and l2 and l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 11:00
L14	248	(l10 l11 l13) not l4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 11:00

EAST Search History

L15	166	("1630239" | "20020022888" | "20020032444" | "20020038123" | "20020072801" | "20020077632" | "20020077700" | "20020077702" | "20020107573" | "20020147485" | "3367326" | "3554192" | "3892232" | "4135506" | "4170990" | "4265231" | "4401112" | "4453539" | "4541423" | "4553273" | "4554914" | "4573448" | "4636217" | "4756649" | "4844088" | "4862891" | "4966604" | "4969888" | "5002546" | "5015255" | "5030201" | "5059193" | "5062850" | "5071437" | "5171279" | "5190546" | "5192326" | "5195968" | "5242443" | "5242444" | "5242461" | "5258031" | "5269785" | "5285795" | "5290289" | "5313962" | "5336223" | "5357983" | "5366457" | "5383884" | "5395188" | "5395317" | "5396880" | "5403276" | "5415661" | "5433739" | "5480440" | "5496322" | "5505732" | "5514137" | "5514180" | "5545228" | "5549679" | "5554163" | "5558674" | "5562736" | "5569248" | "5571189" | "5571190" | "5584887" | "5591170" | "5630816" | "5653708" | "5665122" | "5669909" | "5700291" | "5702454" | "5702455" | "5713904" | "5728097" | "5735899" | "5741253" | "5741261" | "5762629" | "5785709" | "5792044" | "5827328" | "5885292" | "5888220" | "5888223" | "5891147" | "5902231" | "5906616" | "5921971" | "5928239" | "5954635" | "5964761" | "5968062" | "5972015" | "5976146" | "5976187" | "5980504" | "5989256" | "6007487" | "6010495" | "6010502" | "6019792" | "6022362" | "6030162" | "6033406" | "6036696" | "6053916" | "6056749" | "6066152" | "6066154" | "6080099" | "6086589" | "6093207" | "6095149" | "6120502" | "6123705" | "6127597").PN. OR ("6152871" | "6162170" | "6175758" | "6176823" | "6187000" | "6206822" | "6206826" | "6210412" | "6217509" | "6241734" | "6264656" | "6287313" | "6315795" | "6371990" | "6379334" | "6383188" | "6383190" | "6387130" | "6395007" | "6402750" | "6409766" | "6416515" | "6419678" | "6423095" | "6436098" | "6436140" | "6436143" | "6440138" | "6447514" | "6447518" | "6447546" | "6447547" | "6540747" | "6562046" | "RE33258").PN. OR ("6790210"). URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/11 11:59

EAST Search History

L16	50	("1223938" | "1698952" | "1822330" | "2291413" | "2666430" | "2747384" | "2905178" | "3554192" | "3628522" | "3697188" | "3815605" | "4257411" | "4265231" | "4312337" | "4345601" | "4421112" | "4541423" | "4590929" | "4622960").PN. OR ("4941466").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/11 12:15
L17	208	(l15 l16) not (l4 l14)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 12:20
L18	17	l17 and l2 and l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 12:55
L20	11805	(manipulat$ wiggl$ toggle$ reorient$ orient$3 orientation$ readjust$) near5 (tap tapp$3 bonetap$ drill$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:07
L21	9	l1 with l20 with l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:08
L22	13	l1 and (l20 with l3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:08
L23	56	l1 same l20 same l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:09
L24	34	l9 and l20 and l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:09

EAST Search History

L25	16	l17 and l20 and l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:09
L26	61	(l21 l22 l23 l24 l25) not (l4 l14 l17 l18)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:10
L27	9256	(reposition$ move moved moving adjust$3 adjustment angle angled angling wiggl$ manipulat$ toggl$3 reorient$ orient$3 reorient$ readjust$) near3 (tap tapp$3 bonetap$ drill$3) near3 (hole pilothole bore cavity recess opening aperture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:31
L28	376	l1 same l27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:35
L29	292	l28 not (l4 l14 l17 l18 l26)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:36
L30	253	l1 with l27	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:37
L31	194	l30 not (l4 l14 l17 l18 l26)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 13:37
L32	5011	(change changing adjust$3 adjustab$ adjustment manipulat$3 manipulation readjust$ reorient$ reposition$) near3 (drill$3 tap tapp$3 tapper$ bonetap$) near3 (angle angular$ orient$3 orientation position$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 14:31

EAST Search History

L33	5	l1 same l3 same l32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 14:32
L34	86	l1 and l3 and l32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 14:34
L35	81	l34 not l33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/11 14:34

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(19) United States

(12) Patent Application Publication

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(43) Pub. Date: Aug. 14, 2008

Wardle

(54) SURGICAL COILS AND METHODS OF DEPLOYING

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(21) Appl. No.: 12/109,291

(22) Filed: Apr. 24, 2008

Related U.S. Application Data

(62) Division of application No. 10/386,260, filed on Mar. 10, 2003.

(60) Provisional application No. 60/363,106, filed on Mar. 11, 2002.

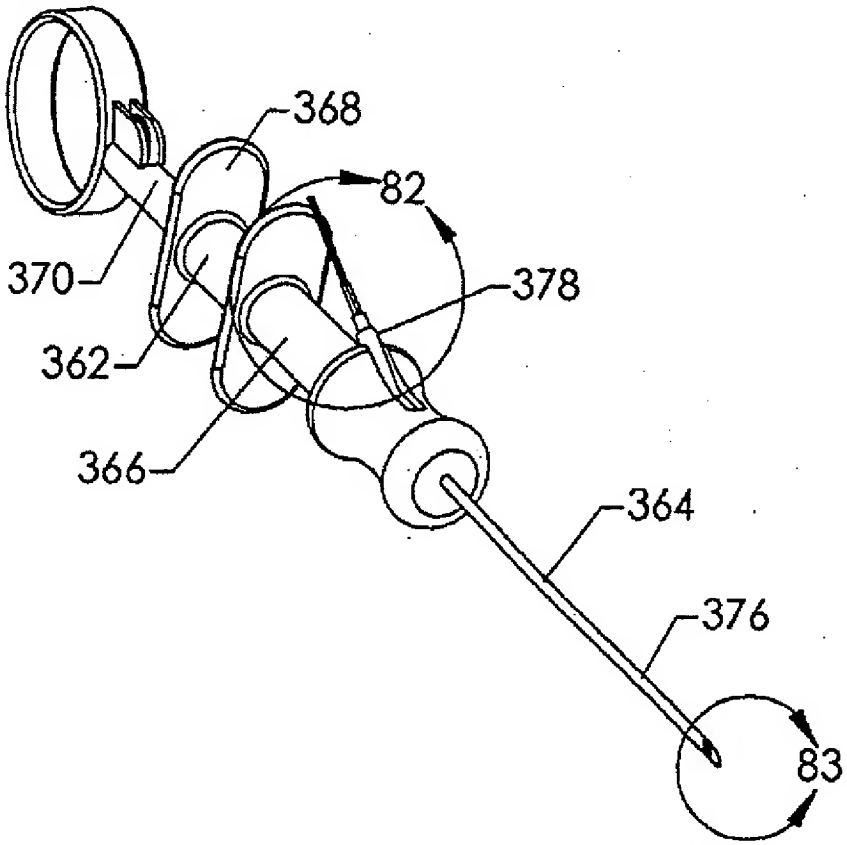
Publication Classification

(51) Int. Cl.
A61B 17/10 (2006.01)

(52) U.S. Cl. 606/219; 606/1

(57) ABSTRACT

Surgical coils for marking, anchoring, stapling and suturing that can be implanted in the body by deforming it to a small cross section profile and then sliding it through a low profile delivery device then deploying from an embodiment of a delivery device at a targeted site. Embodiments of surgical coils when deployed revert back to a coiled configuration and circle tissue at the target site. Can be deployed about attachment members, such as suture lines, marker lines and the like for anchoring same.



DOCUMENT-IDENTIFIER: US 20080195146 A1

TITLE: SURGICAL COILS AND METHODS OF DEPLOYING

---------- KWIC ---------

Brief Summary Text - BSTX (6):

[0005]The present invention relates to surgical coils and variety of devices that can effectively deploy surgical coils by different methods for a variety of clinical applications and indications. Techniques are also disclosed for simultaneously positioning and securing various attachment elements to surgical coils. Surgical coils disclosed herein can be used in numerous clinical applications including but not limited to tissue stapling, tissue anchoring including **bone** and suture anchors and tissue marking.

Brief Summary Text - BSTX (16):

[0015]In another embodiment, a method for deploying a plurality of surgical coils from within a channel is disclosed and includes positioning distal ends of a plurality of delivery sheaths stabilized by a delivery sheath housing at a deployment site **within a cavity,** expanding an expandable member which is surrounded by the plurality of delivery sheaths until distal ends of the delivery sheaths are disposed against target material, axially advancing a plurality of surgical coils through the delivery sheaths, out of distal ports of the delivery sheaths and into target material, and continuing to advance the surgical coils into the target tissue allowing elongate elements of the surgical coils to self-form into an enclosed configuration with an overlapped portion of each elongate element making contact with itself in the overlapped portion.

Description of Disclosure - DETX (103):

[0122]FIG. 92 is an elevational view of a portion of **bone** tissue

of a
patient.

Description of Disclosure - DETX (104):
[0123]FIG. 93 is a transverse cross sectional view of the **bone** tissue of
FIG. 92 taken along lines 93-93 of FIG. 92 illustrating first and second
surgical coils deployed at two different sites on the **bone** tissue portion with
attachment members extending from the **bone** tissue.

Description of Disclosure - DETX (105):
[0124]FIG. 94 is an enlarged view of encircled portion 94 of FIG. 93
illustrating the first surgical coil deployed **within a cavity of the bone**
tissue.

Description of Disclosure - DETX (106):
[0125]FIG. 94A is an enlarged view of a delivery device deploying a
surgical coil about a suture attachment member **within a cavity of bone** tissue.

Description of Disclosure - DETX (107):
[0126]FIG. 95 is an enlarged view of encircled portion 95 of FIG. 93
illustrating the second surgical coil deployed **within a cavity of the bone**
tissue.

Description of Disclosure - DETX (148):
[0166]Suturing and suture line placement are necessary aspects of most
surgical procedures. Embodiments of the current device provide devices and
methods for placing sutures and suture lines in confined spaces. Suture
anchors can be used to mount suture to **bone** for subsequent attachment of
ligaments, tendons, or other tissue. Some known suture anchors are inserted
into pre-drilled holes in the **bone,** while others are "self-tapping" and are
threaded into the **bone** through the **bone** surface. In either case, ridges, which
extend outwardly from the exterior surface of the suture anchor facilitate
retention of the anchor in the **bone** tissue.

Description of Disclosure - DETX (149):

[0167]Anchors of this type typically use up a large surface area relative to the size of the suture and so the number of anchors that can be used in any single location of placement is limited due to the confined surgical space at the site of installation. Another limitation of these known anchors is that they only can only be reliably used when the full length of the anchor is embedded in **bone**. Embodiments of the current invention provide devices and methods for reliable **bone** anchoring sutures that require minimal **bone** surface disruption space and skill to install and can also be reliably attached to thin cross sections of **bone**.

Description of Disclosure - DETX (173):

[0191]Surgical coils 10 may be used as tissue markers with a small dimensional configuration. One embodiment of a surgical coil marker 42 can have an outer diameter of about 0.060'' to about 0.100''. In addition, if a surgical 42 coil is to be used as a marker and will not be subjected to significant stresses, the surgical coil marker can have a low number of coil rotations or small to non-existent amount of circumferential overlap. Surgical coil markers 42 used to identify specific target areas within tissue are generally not required to carry any load and need only to be large enough to be detected by suitable medical imaging devices. Surgical coils 10 used as soft tissue or **bone** anchors may be larger than surgical coil markers, with some embodiments having an outer diameter of about 0.100'' to about 0.300''. Such surgical coils can have 2 or more coil rotations, i.e., 360 degrees or more of circumferential overlap, and can be attached to a second component or attachment member if desired. Such a surgical coil anchor may be used to anchor itself at a specific target tissue area and support the joined attachment.

Description of Disclosure - DETX (201):

[0219]Referring to FIGS. 92-95, a surgical coil anchor 414 can be used in applications such as anchoring ligaments or tendons, when performing soft tissue surgical reconstruction, ruptured tendons, or torn ligaments, and other indications in which a surgeon wants to reconstruct or repair connective tissue with respect to the **bone** tissue. In one embodiment, a surgical coil anchor 414 is placed through a pre-drilled pilot hole 416 disposed in **bone** tissue 418 of a patient, having a diameter much smaller than an outer diameter of the surgical coil anchor 414 as shown in FIGS. 92-95. The deployment shaft assembly 364 of the delivery device 362 is subsequently introduced into the pilot hole 416 and the surgical coil anchor 414 is deployed therein along with a suitable attachment member 372 into the **bone** 418. A ligament or tendon may then be sutured and anchored to the **bone** tissue 418 using the anchor attachment 414. The anchor attachment 414 can be a piece of suture, wire or the like.

Description of Disclosure - DETX (202):

[0220]A **bone**-drilling device (not shown) can be used that permits the **drill to adjust its approach angle** while maintaining the same entry point at the **bone** surface 420. Multiple passes of the drill can be made into the **bone** at the same entry point 418 at varying angles to produce a small round profile hole 416 at the surface 420 of the **bone** 418 tapering to an incrementally larger oval profile hole or cavity 422 beneath the surface 420 of the **bone** tissue 418 as seen in FIG. 93. The round entry hole 416 is made large enough to accept a distal end 392 of a delivery device 362 while part of the oval profile cavity 422 beneath the surface 420 of the **bone** tissue 418 is made large enough to accommodate a surgical coil anchor 414.

Description of Disclosure - DETX (203):

[0221]Alternatively a straight pilot hole 424 can be drilled

through a thin
section of **bone** tissue 418 and into the **bone** marrow 426 as shown in FIG. 94.
Thereafter, the delivery device 362 can be introduced through the pilot hole
424 into the marrow 426 and the surgical coil anchor 414 deployed along with an
attachment member 372 into the **bone** marrow 426.

Description of Disclosure - DETX (205):
[0223]The attachment member 442 is loaded into a distal port 444 of the
outer sheath 432 until a proximal end of the attachment member 442 rests
against a stop 448 which is fixed to an outside surface 450 of a delivery
sheath 452 disposed within the outer sheath 432 at which point the retainer
spring 438 also engages the proximal slot 434 in the outer sheath 432. The
deployment shaft assembly 430 is then advanced to a target site, and the outer
sheath 432 retracted relative to the attachment member 428 and delivery sheath
452 until the retainer spring 438 on the attachment member 428 engages the
distal slot 436 of the outer sheath 432 as shown in FIG. 99. A surgical coil
454 is then deployed from a distal port 456 of the delivery sheath 452 through
the attachment loop 440 of the attachment member 428 as shown in FIG. 99. The
deployment shaft assembly 430 is thereafter retracted proximally leaving the
attachment member 428 secured to the tissue at the target site or captured by
bone tissue 418 if deployed in a cavity 422 formed in **bone** tissue 418, or the
like as shown in FIGS. 100 and 101.

Description of Disclosure - DETX (212):
[0230]Referring to FIGS. 126-135, an embodiment of a method and tools for
manufacturing surgical coils are illustrated. FIGS. 126-130 illustrate a shape
forming jig 502 for shape setting a piece of ribbon material 504, such as
metallic Nitinol ribbon material, into a coil configuration. The jig 502 has a
cylindrical **cavity 506 with an inside** diameter that defines an

outside diameter
of a coil produced by the jig 502. An access slot 508 communicates from the
cylindrical cavity 506 to an outer wall 510 of the jig body 502. Both the
cylindrical cavity 506 and the access slot 508 are open at a top surface 512 of
the jig 502 to facilitate removal of the heat set ribbon 504, as shown in FIG.
130. A post member 514 is positioned in the center of the cylindrical cavity
506 which is cylindrically shaped and together with the cylindrical cavity 506
of the jig 502 body forms a circular slot 516 in communication with the access
slot 508.

Claims Text - CLTX (22):
22. The method of claim 13 further comprising pre-forming a cavity in
target tissue prior to positioning the distal end of the deployment shaft
assembly adjacent a deployment site in the cavity and further comprising
deploying the surgical coil **within the cavity** such that the surgical coil is
trapped in the cavity and the attachment member extends from the cavity.

Claims Text - CLTX (23):
23. The method of claim 22 wherein the cavity is formed in **bone** tissue and
the surgical coil is deployed within and trapped by **bone** tissue.

Claims Text - CLTX (24):
24. The method of claim 22 wherein the cavity is formed in **bone and bone**
marrow and the surgical coil is disposed at least partially within **bone** marrow.

US005636986A

United States Patent [19]

Pezeshkian

[11] Patent Number: 5,636,986

[45] Date of Patent: Jun. 10, 1997

[54] **DRILL GUIDE FOR DENTAL IMPLANTS AND METHOD**

[76] Inventor: **Alex A. Pezeshkian**, 1831 Deer Mont Rd., Glendale, Calif. 91207

[21] Appl. No.: **597,108**

[22] Filed: **Feb. 6, 1996**

[51] **Int. Cl.**[6] **A61C 3/00**; A61C 3/02; A61C 11/00

[52] **U.S. Cl.** **433/76**; 433/213; 433/75

[58] **Field of Search** 433/75, 72, 76, 433/213

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,380,040	5/1921	Chayes	433/76
3,407,503	10/1968	Nealon	433/76
5,055,042	10/1991	Jansen	433/76
5,320,529	6/1994	Pompa	433/76

FOREIGN PATENT DOCUMENTS

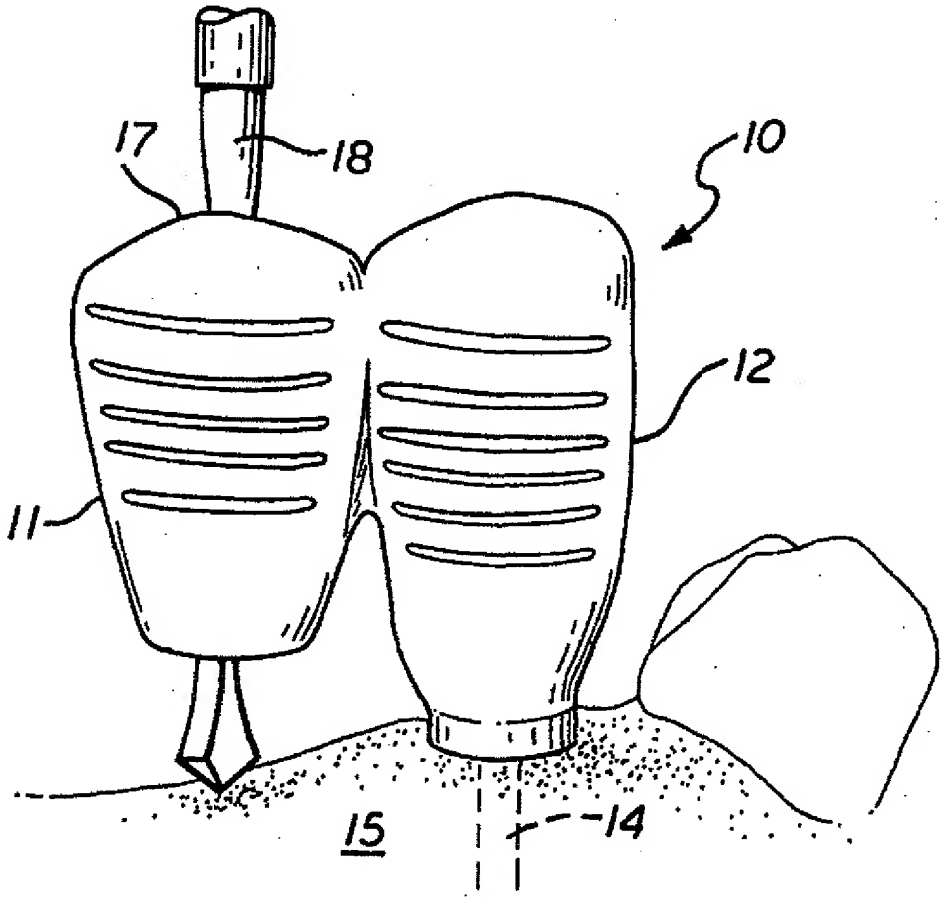
512181	8/1939	United Kingdom	433/76

Primary Examiner—Cary E. O'Connor
Attorney, Agent, or Firm—Gerald L. Price

[57] **ABSTRACT**

A drill guide system for use in the installation of dental implants. The guides are configured in the shape of teeth and have drill bushings passing through to guide and position the drill so that the resulting hole will receive an implant that is properly positioned and aligned. The guides are provided in different configurations depending on the number of adjacent implants to be installed and have a depending pin to position the guide in an initial drilled hole. By being configured in the shape of teeth, the dental surgeon is able to position the guide prior to drilling and be able to observe how the resulting work will appear once the actual prosthetics are installed on the implants. The drill bushings not only guide the drill but provide additional patient security since the possibility of slippage or breakage of the drill bit during drilling is substantially reduced.

5 Claims, 1 Drawing Sheet



US-PAT-NO: 5636986

DOCUMENT-IDENTIFIER: US 5636986 A

TITLE: Drill guide for dental implants and method

---------- KWIC ---------

Brief Summary Text - BSTX (5):

It will be readily appreciated that to achieve proper alignment and appearance, the location and angie of the hole that the dental surgeon drills to receive the implant is very important. **In many cases the hole** has been drilled on a trial and error basis starting with an undersized **drill and correcting the angle and position with the final drill**. Such a procedure is very time consuming and still fails to ensure proper final alignment and appearance. There have been several drilling guides on the market but in general they fail to provide a complete and cost effective solution since they fail to fully position the drill for a single drilling operation, some have to be made up for each patient which is not cost effective and they all fail to properly guide the drill during the drilling operation.

Detailed Description Text - DETX (3):

Referring now to FIG. 1, an exemplary implant drilling guide generally indicated at 10 is illustrated in the form of a guide for installing two adjacent implants, the guide including two housings 11 and 12 that are fixed together in a size and configuration to resemble adjacent teeth. The housing 12 is provided with a pin 14 shown here in dotted lines, which is sized to be firmly inserted in a hole that has been drilled in the jaw **bone** 15 to receive same.

US 20060105293A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2006/0105293 A1

Funato (43) Pub. Date: May 18, 2006

(54) DENTAL BUR AND DRILLING METHOD USING THE SAME

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(21) Appl. No.: 11/270,036

(22) Filed: Nov. 9, 2005

(30) Foreign Application Priority Data

Nov. 16, 2004 (JP) 2004-331803

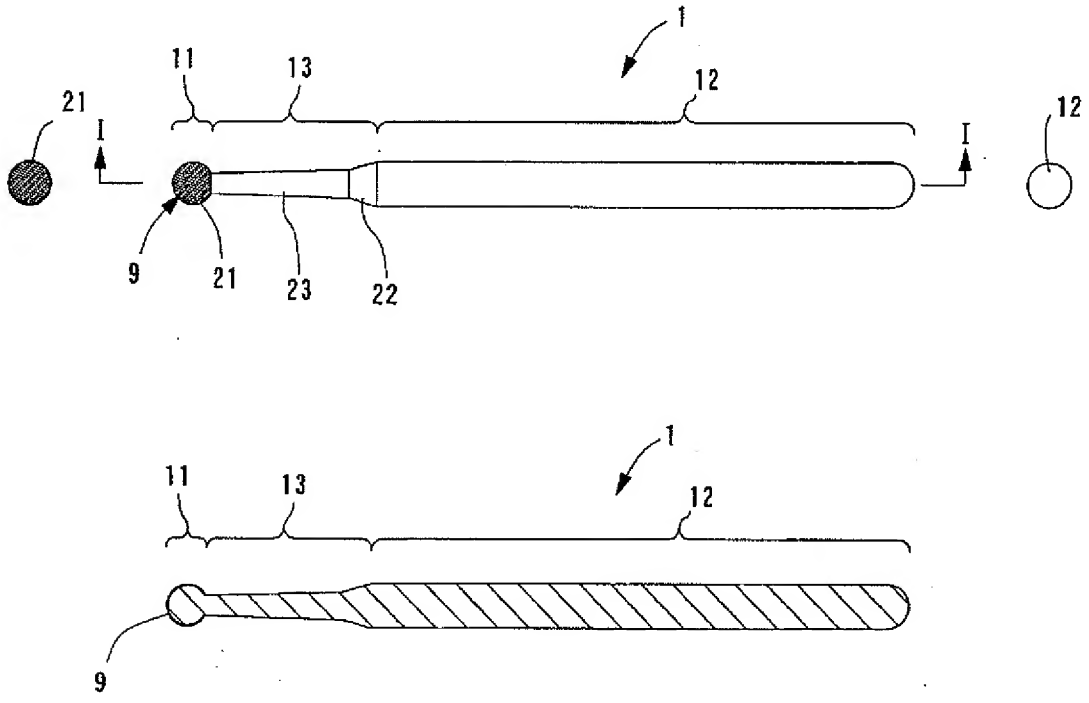
Publication Classification

(51) Int. Cl.
A61C 3/02 (2006.01)

(52) U.S. Cl. 433/165

(57) ABSTRACT

A dental bur includes a cutting section on one side thereof, a support section on the other side thereof and a neck section connecting the cutting section to the support section. The cutting section has a spherical shape having a predetermined radius. The cutting section is coated with diamond particles.



DOCUMENT-IDENTIFIER: US 20060105293 A1

TITLE: Dental bur and drilling method using the same

---------- KWIC ---------

Description of Disclosure - DETX (9):

[0021] In the drilling operation, the support section 12 is connected to the rotary machine and the dental bur is rotated with the axis thereof serving as the axis of rotation. Not only the end of the cutting section 11 but also the outer circumference of the cutting section 11 cuts jawbone. The neck section 13 serves as a guide of the depth of the hole in the drilling operation while also serving as a water flow storing portion. During the drilling operation, the depth of the hole is learned without using the depth gauge while heating due to **bone** cutting is prevented.

Description of Disclosure - DETX (22):

[0034] A hole is drilled in the jawbone to embed implants using the dental burs 1, 2, and 3 as described below, for example. An initial hole is drilled in a planned implant position using the dental bur 1 of FIGS. 1A-1D. The hole is further deepened to a depth required for the planned implant using the dental bur 2 of FIGS. 2A-2D. The hole is then widened in diameter using the dental bur 3 of FIGS. 3A-3D. Throughout the drilling operation, cooling water is continuously supplied to the hole. **In particular, when the hole** is drilled to a required depth using the dental bur 2 and the dental bur 3, the neck section 13 serves as a guide to the depth of the hole. Without using the depth gauge, the hole having the required depth is reliably drilled. Since the sidewall of the hole is also cut with the diamond particles 9 on the cutting section 11, the **angle of the hole is relatively easily adjusted in the middle**

of the drilling operation.

Description of Disclosure - DETX (24):

[0036] In accordance with embodiments of the present invention, the dental burs 1, 2, and 3 are used at an initial phase of hole drilling prior to the drilling operation of the conventional twist **drills and easily adjust the angle** of the hole at the initial phase of the drilling operation.

US 20070178427A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0178427 A1**

Murias (43) **Pub. Date: Aug. 2, 2007**

(54) **MANUAL DRIVER FOR IMPLANT DRILLS AND METHOD OF DENTAL IMPLANTATION**

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(21) Appl. No.: **11/698,231**

(22) Filed: **Jan. 25, 2007**

Related U.S. Application Data

(60) Provisional application No. 60/762,730, filed on Jan. 27, 2006.

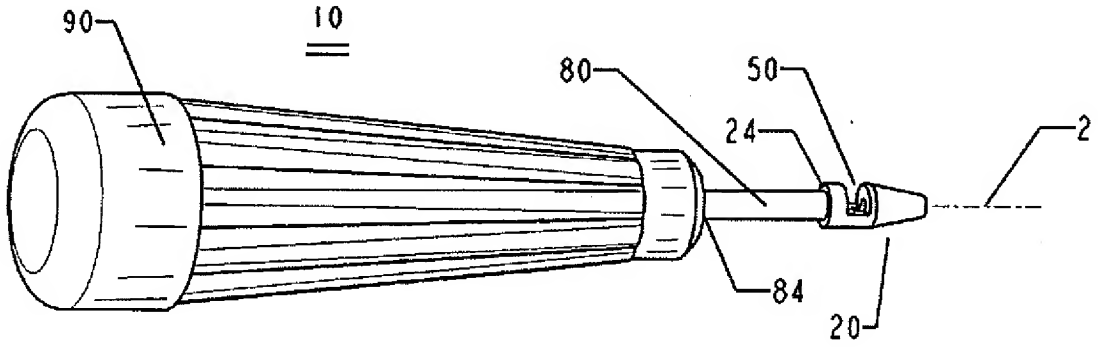
Publication Classification

(51) **Int. Cl.**
A61C 3/00 (2006.01)

(52) **U.S. Cl.** **433/141**

(57) **ABSTRACT**

A manual driver for a dental implant drill or other dental implant tools and the method of use for preparing for dental implantation are provided. The manual driver includes a handle, an extension shank and a chuck having an axial channel configured to receive and interlock an implant drill, and a fastening screw transverse to the axial channel. The method of manual preparation for dental implantation using the manual driver has a high precision, and reduces the risk of bone cracking caused by vibration of motor-driven drilling. The manual drilling method provides better tactile sensation and drilling control to the dentist. Further, the method avoids drilling irrigation, allows collection of virgin bone tissue from the drills, and reintroduces the collected bone tissue in the receiving bore to promote bone regeneration after the implantation.



DOCUMENT-IDENTIFIER: US 20070178427 A1

TITLE: Manual driver for implant drills and method of dental implantation

---------- KWIC ---------

Description of Disclosure - DETX (40):

[0034]In one embodiment, the method is directed to a manual preparation process for dental implantation. The method is described herein according to the sequence of the process steps using manual driver 10. First, a manual driver 10 is provided, and a first implant drill is secured into chuck 20 by inserting the shaft of the first implant drill all the way to stop 54 and tightening fastening screw 60. Then, the first implant drill is manually driven into a selected location in a patient's mouth to create an initial bore by turning manual driver 10 back and forth, i.e., clockwise and counter clockwise, until the first implant drill reaching a desired depth. Herein, the bore created by drilling is also referred to as **osteotomy** site. At this stage, manual driver 10 is removed from the shaft of the first implant drill by loosening the fastening screw 60, while the first implant drill is left **within the initial bore**. Then, a x-ray image of the initial bore is taken to confirm proper angulation of the initial bore. Upon confirming the proper angulation, the first implant drill is removed from the initial bore by turning back and forth, and then the **bone** tissue on threads of the first implant drill is collected in a sterilized container. At this stage, if angulation of the initial bore is improper, further **drilling with the first implant drill to correct the angle** of the initial bore is performed. After the initial drilling, the initial bore is expanded using one or more implant

drills that have a sequentially, or stepwise, increased diameter from the prior implant drill. In each drilling, the implant drill is secured into manual driver as described above, and the drilling is performed manually by turning the driver clockwise and counter clockwise. In this step, typically one to three implant drills can be used until obtaining a final bore that has the desired diameter. After each step of drilling, the implant drill is retrieved from the bore, and the **bone** tissue on threads of the implant drills is collected into the sterilized container. Once the final bore is obtained, the collected **bone** tissue is placed back into the final bore, using a specula or other suitable tools. After filling, a plugger can be inserted to push the **bone** tissue down. Typically, about 30% to about 50% of the interior of the final bore is filled with the collected **bone** tissue. Then, a predetermined dental implant is placed, using the conventional method, into the final bore that is filled with the collected **bone** tissue. When the implant is in place, the area around the top of the dental implant is further packed with the collected **bone** tissue. Then, an absorbable collagen wound dressing is applied, and the gum is sutured according to the requirement of the subsequent implant procedures.

US 20040220577A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2004/0220577 A1

Cragg et al. (43) Pub. Date: Nov. 4, 2004

(54) METHODS AND APPARATUS FOR FORMING SHAPED AXIAL BORES THROUGH SPINAL VERTEBRAE

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(21) Appl. No.: 10/853,476

(22) Filed: May 25, 2004

Related U.S. Application Data

(63) Continuation of application No. 09/710,369, filed on Nov. 10, 2000, now Pat. No. 6,740,090.

(60) Provisional application No. 60/182,748, filed on Feb. 16, 2000.

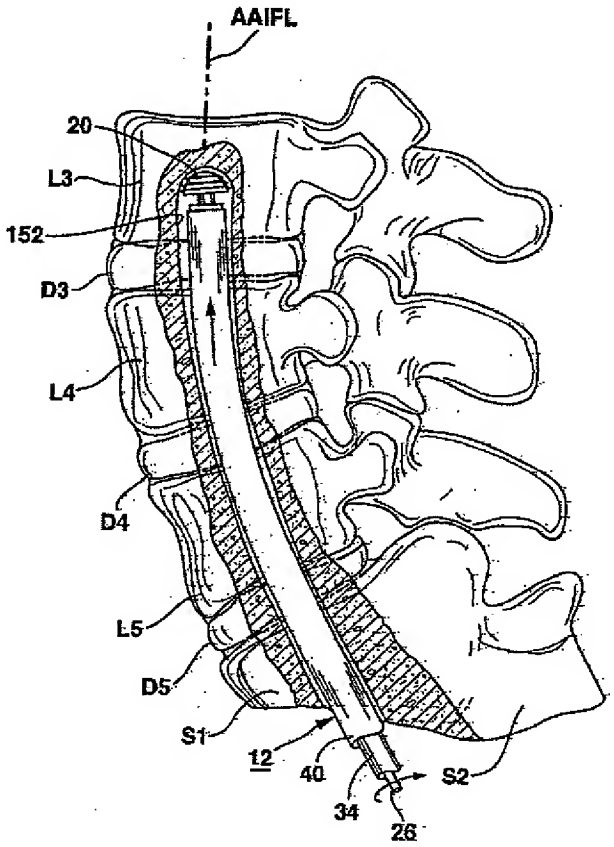
Publication Classification

(51) Int. Cl.[7] A61B 17/16

(52) U.S. Cl. 606/80

(57) ABSTRACT

One or more shaped axial bore extending from an accessed posterior or anterior target point are formed in the cephalad direction through vertebral bodies and intervening discs, if present, in general alignment with a visualized, trans-sacral axial instrumentation/fusion (TASIF) line in a minimally invasive, low trauma, manner. An anterior axial instrumentation/fusion line (AAIFL) or a posterior axial instrumentation/fusion line (PAIFL) that extends from the anterior or posterior target point, respectively, in the cephalad direction following the spinal curvature through one or more vertebral body is visualized by radiographic or fluoroscopic equipment. Preferably, curved anterior or posterior TASIF axial bores are formed in axial or parallel or diverging alignment with the visualized AAIFL or PAIFL, respectively, employing bore forming tools that can be manipulated from proximal portions thereof that are located outside the patient's body to adjust the curvature of the anterior or posterior TASIF axial bores as they are formed in the cephalad direction. Further bore enlarging tools are employed to enlarge one or more selected section of the anterior or posterior TASIF axial bore(s), e.g., the cephalad bore end or a disc space, so as to provide a recess therein that can be employed for various purposes, e.g., to provide anchoring surfaces for spinal implants inserted into the anterior or posterior TASIF axial bore(s).



DOCUMENT-IDENTIFIER: US 20040220577 A1

TITLE: Methods and apparatus for forming shaped axial bores through spinal vertebrae

---------- KWIC ---------

Detail Description Paragraph - DETX (28):

[0077] Slight but abrupt angular changes in the overall curvature of the anterior TASIF axial **bore 152 are made within the vertebral** bodies of L5 and L4 as shown in FIGS. 15 and 16, by caudal retraction of the outer sheath 40 and cephalad advancement of inner sheath 34. It is expected that it will usually be easier to **adjust the angle of the drill** bit 20 within the spongy **bone** interior to the **vertebral** bodies than in the disc space or while boring through the harder exterior **vertebral bone**. Therefore, after the spongy interior **bone** is bored through, the outer sheath 40 is advanced in the distal direction to straighten the **angle of advancement of the drill** bit 20 through the harder **vertebral bone** on either side of the disc. This straightened boring **angle of attack is shown in FIG. 17, for example, where the drill** bit 20 is advanced across the opposed faces of **vertebral** bodies L4 and L5 with the outer sheath 40 fully advanced in the cephalad direction. This process results in short relatively straight sections separated by more curved sections of the of the anterior TASIF axial bore 152. Thus, the resulting anterior TASIF axial bore 152 shown in FIG. 18 exhibits an overall curvature tracking the **spinal** curvature and the visualized AAIFL, but the curve radius varies, showing a shorter radius within the central portions of **vertebral** bodies L5 and L4.

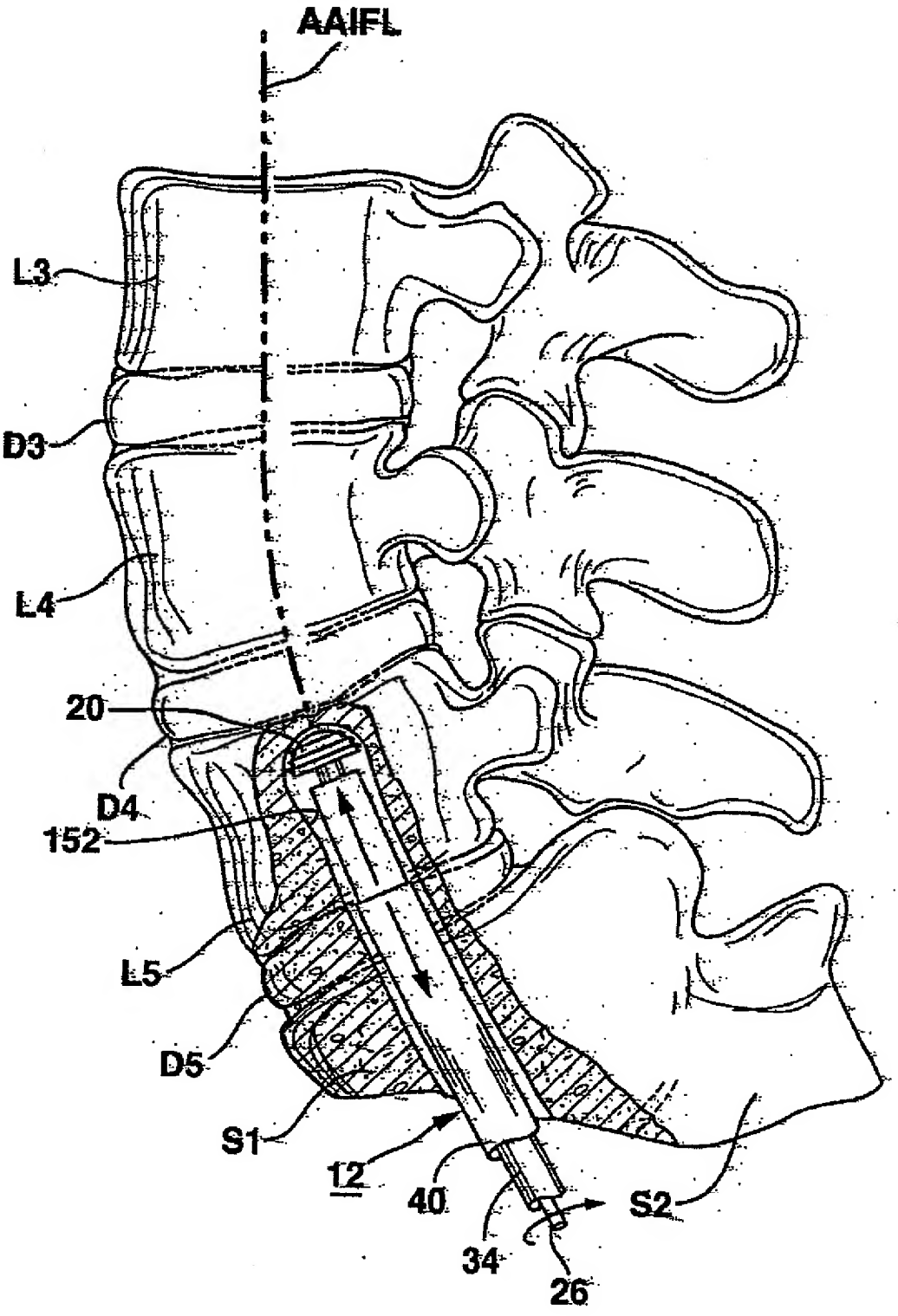


FIG. 15

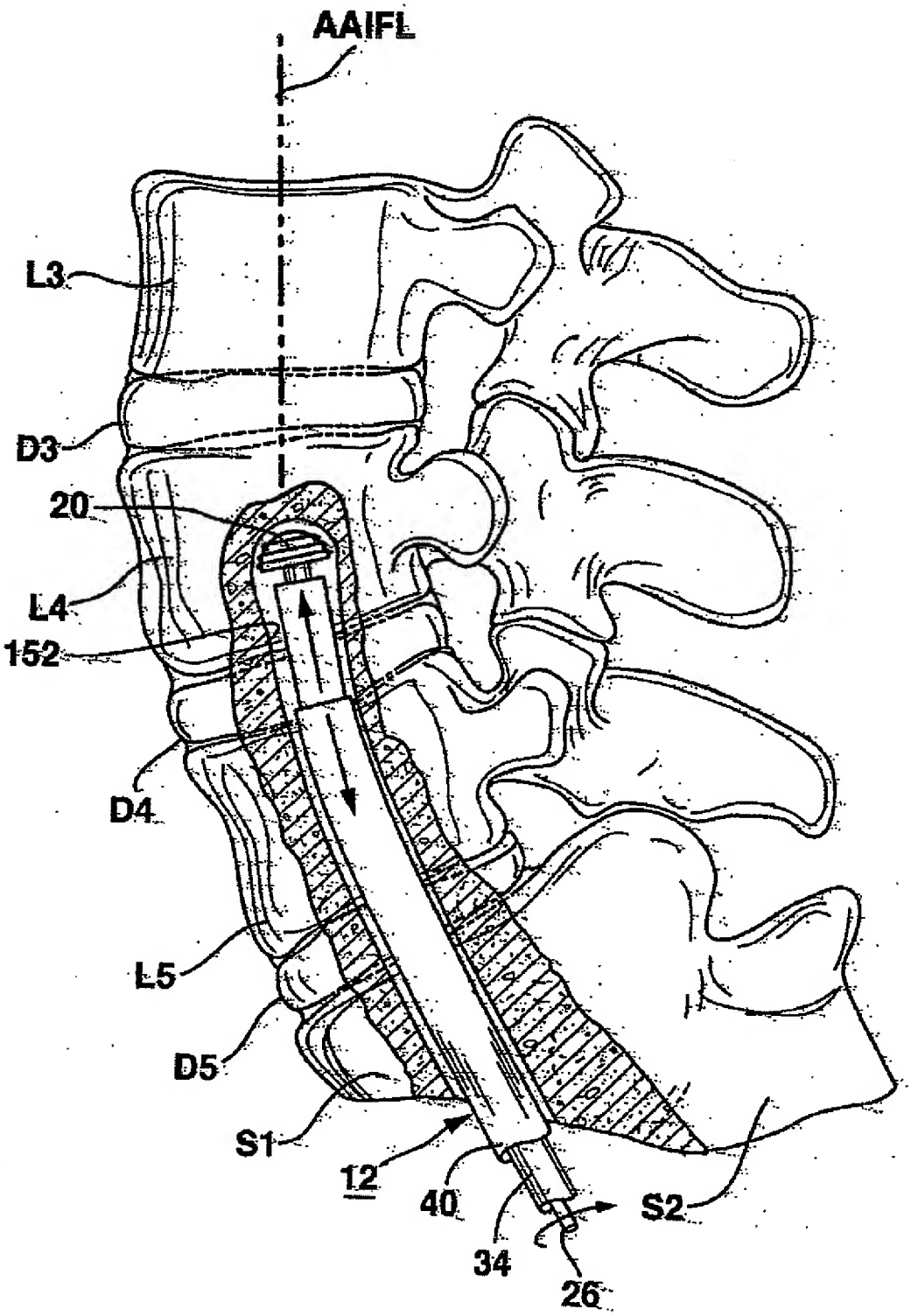


FIG. 16

US 20060100637A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2006/0100637 A1

Rathbun et al. (43) Pub. Date: May 11, 2006

(54) DRILL-TAP-SCREW DRILL GUIDE

(76) Inventors: David S. Rathbun, Gap, PA (US); Sean S. Suh, Kirkland, WA (US); Christoph Andreas Roth, West Chester, PA (US); Lan Anh Nguyen Duong, Denver, PA (US); Christopher J. Ryan, West Chester, PA (US)

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(21) Appl. No.: 11/255,221

(22) Filed: Oct. 19, 2005

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/823,215, filed on Apr. 12, 2004.

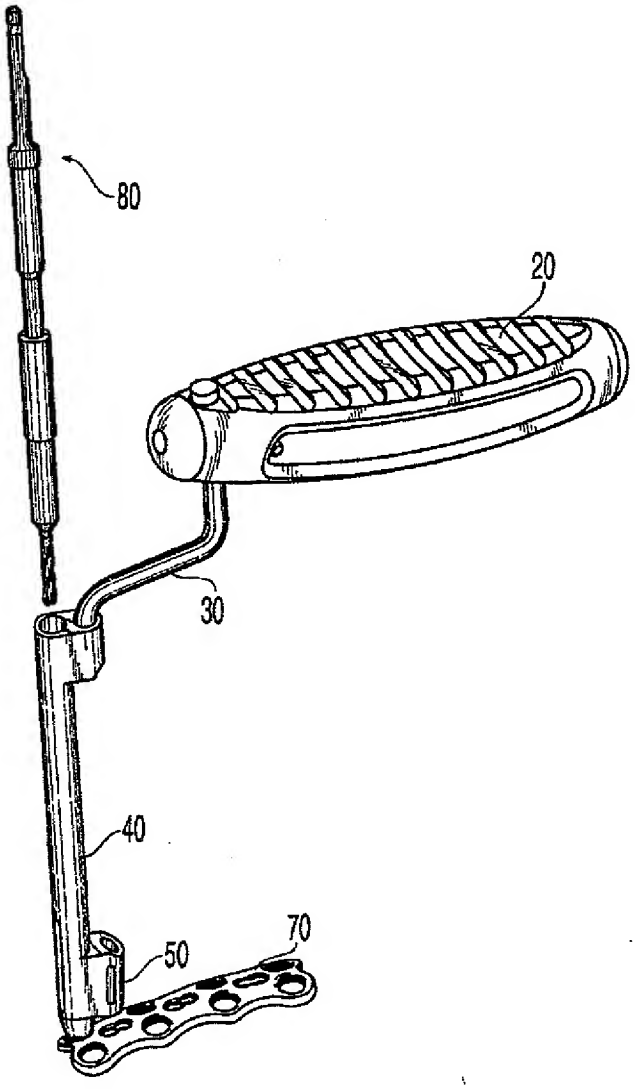
Publication Classification

(51) Int. Cl.
A61B 17/60 (2006.01)

(52) U.S. Cl. 606/96

(57) ABSTRACT

A surgical drill guide for use with a bone plate having fastener holes oriented at predetermined angles with respect to the plate, the surgical drill guide having at least one alignment drill guiding barrel that is aligned with the respective fastener holes in the bone plate for drilling the holes at the desired range of angles permitted by the plate hole.



DOCUMENT-IDENTIFIER: US 20060100637 A1

TITLE: Drill-tap-screw drill guide

---------- KWIC ---------

Description of Disclosure - DETX (53):

[0082] The drill guide barrel distal end 46 may further have a conical nose portion 42 configured and dimensioned to be received within the conical bone screw holes 74R, L of bone plate 70. In one embodiment, the conical nose portion may have a taper angle .alpha. configured to substantially match the taper of the corresponding conical portion 174R, L of bone screw hole 74R, L. Alternatively, the taper angle .alpha. may be greater than or less than that of the bone screw hole conical portion 174R, L. It is noted that any appropriate taper angle .alpha. may be provided, as long as the taper functions to center the guide barrel **within the bone screw hole** to precisely align the barrel with the **bone** screw hole to ensure the appropriately placed and **angled hole is drilled** in the underlying **bone**. In one embodiment, the taper angle .alpha. of the conical nose portion may be about 12 degrees. Furthermore, the end surface 460 of the guide barrel distal end 46 may be non-orthogonal with respect to the guide barrel bore axis "B-B," so that when the conical nose portion of the guide barrel is received within the bone screw hole, the end surface 460 is substantially parallel to the underside surface of the bone plate (i.e. to reduce or eliminate the chance that any portion of the guide barrel might extend through the bone screw hole and contact the underlying bone). In one embodiment, the angle .gamma. formed between the end surface 460 and the guide bore axis "B-B" may be about 85 degrees. Providing an angled end surface 460 further may allow the drill guide conical nose portion 42 to engage a portion of the bone screw hole 74R, L even

where the
conical nose portion 42 is not precisely aligned with the tapered portion 174
of the bone screw hole (i.e. where the axis "B-B" of the drill guide barrel is
not coaxial with the trajectory of the bone screw hole). This may be the case
when the surgeon is initially aligning the guide barrel with the bone screw
hole, or it may also be where the surgeon purposely aligns the guide barrel out
of alignment with the bone screw hole trajectory (for example, to align the
bone screw with an area of higher integrity bone than exists at the point
directly in line with the bone screw hole trajectory).

Description of Disclosure - DETX (64):
[0093] The distal end of location post 52 may comprise a nose section 530
configured to sit within the slot end-hole 72 of the bone plate 74. In the
illustrated embodiment, the nose section 530 has rounded sides 532 and a flat
end 534. In this embodiment, the rounded sides 532 are configured to contact
the inner surface 172 of slot end-hole 72 to seat the post **within the hole,** but
without axially retaining the post therein (i.e. lifting the drill guide up off
the **bone** plate will not cause the plate to **move upward with the drill** guide).

Description of Disclosure - DETX (65):
[0094] This configuration of the nose section 530 and the slot end-hole 72
may allow the location post 52 to "toggle" **within the hole,** thus allowing the
surgeon to **adjust the drill** guide barrel 40 trajectory slightly within the
targeted **bone** screw hole 74R, L while still maintaining the connection between
the location post 52 and the plate end-hole 72. This "toggling" feature may
the surgeon to customize the trajectory of the hole (i.e. alter it from the
trajectory of the bone screw hole 74R, L) that will be drilled into the bone,
thereby customizing the trajectory of the bone screw that will be placed in the

hole. This feature may provide the surgeon with an important degree of
flexibility the bone underlying the plate is of varying integrity. For
example, where the area of bone directly in line with the bone screw hole 74R,L
is of sub-standard integrity, a slight adjustment in the guide barrel trajectory (while still maintaining the nose 42 engaged with the bone screw
hole 74R, L) may allow the surgeon the option of placing the hole (and thus the
screw) within an immediately adjacent higher integrity area of bone.

US 20060264956A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2006/0264956 A1

Orbay et al. (43) Pub. Date: Nov. 23, 2006

(54) METHODS AND APPARATUS FOR BONE FASTENER IMPLANTATION

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(21) Appl. No.: **11/134,248**

(22) Filed: **May 20, 2005**

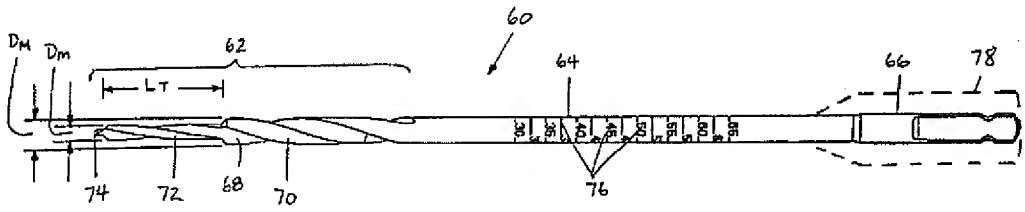
Publication Classification

(51) **Int. Cl.**
A61B 17/00 (2006.01)

(52) **U.S. Cl.** **606/80**

(57) **ABSTRACT**

A fracture fixation system is provided for a fracture of a head portion of a long bone which has subchondral bone defining a convex articular surface, and particularly the proximal humerus. The system includes both smooth pegs and pegs having a threaded shaft. The shaft of the threaded shaft pegs having both smooth and threaded portions. Threaded shaft pegs of different lengths all have the same length threaded portion, but different length smooth portions. A drill bit and depth gauge for use with the system are also provided. A method for drilling holes is also provided.



DOCUMENT-IDENTIFIER: US 20060264956 A1

TITLE: Methods and apparatus for bone fastener implantation

---------- KWIC ---------

Description of Disclosure - DETX (17):

[0030] Using a short first drill bit under power, the lateral cortex is penetrated to start the peg **holes 40a-f within the bone**. Drill guides are preferably aligned relative to the peg hole axes to facilitate **drilling the remainder of the hole at the proper axial orientation**. For smooth shaft pegs 20, a different non-stepped drill bit (not shown) is then used to drill the rest of the holes to the appropriate the depth. Such drill bit has all of the features described with respect to step drill bit 60, but the working end has a constant diameter D.sub.M, with the optional provision of the protruding blunt tip. For threaded shaft pegs 22, the step drill bit 60 is used to the drill the holes to appropriate depth. **In accord with the invention, the drilling of the holes** through the humeral head after penetration of the cortex is performed entirely by hand, by manual manipulation of the bit. The cancellous **bone** within the central region of the humeral head is relatively soft and easy to **drill through under manual manipulation of the drill** bit. While fluoroscopy is preferably used to prevent penetration of the subchondral **bone,** manual drilling provides sufficient tactile feedback of when the drill bit reaches the far cortex that fluoroscopy is not essential to determine when the hole is of proper depth. Particularly, the protruding blunt tip 74 (FIG. 4) functions as a stop against the hard far cortex at the appropriate hole depth.

US006790210B1

(12) **United States Patent**
Cragg et al.

(10) **Patent No.: US 6,790,210 B1**
(45) **Date of Patent: Sep. 14, 2004**

(54) **METHODS AND APPARATUS FOR FORMING CURVED AXIAL BORES THROUGH SPINAL VERTEBRAE**

(75) Inventors: **Andrew H. Cragg**, Edina, MN (US); **Jonathan Kagan**, Hopkins, MN (US)

(73) Assignee: **TranS1, Inc.**, Wilmington, NC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 172 days.

(21) Appl. No.: **09/709,105**

(22) Filed: **Nov. 10, 2000**

Related U.S. Application Data

(60) Provisional application No. 60/182,748, filed on Feb. 16, 2000.

(51) **Int. Cl.**[7] **A61B 17/16**
(52) **U.S. Cl.** **606/80**; 606/180; 606/61
(58) **Field of Search** 606/61, 79, 80, 606/85, 180

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,630,239	A	5/1927	Binkley et al.	
3,367,326	A	2/1968	Frazier	
3,554,192	A	1/1971	Isberner	
3,892,232	A	7/1975	Neufeld	128/92 EB
4,135,506	A	1/1979	Ulrich	
4,170,990	A	10/1979	Baumgart et al.	128/92 B
4,265,231	A	5/1981	Scheller, Jr. et al.	128/92 E
4,401,112	A	8/1983	Rezaian	128/92 B
4,453,539	A	6/1984	Raftopoulos et al.	128/92 BC
4,541,423	A	9/1985	Barber	128/92 E
4,553,273	A	11/1985	Wu	623/18
4,554,914	A	11/1985	Kapp et al.	
4,573,448	A	3/1986	Kambin	
4,636,217	A	1/1987	Ogilvie et al.	623/17
4,756,649	A	7/1988	Heule	408/178
4,844,088	A	7/1989	Kambin	

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

EP	0 611 116 B1	4/1994
EP	0 980 677 A1	2/2000

(List continued on next page.)

OTHER PUBLICATIONS

Friedrich W. Rathke and Karl F. Schlegel—Surgery of the Spine—Atlas of Orthopaedic Operations, vol. 1—1979—pp 222–224.

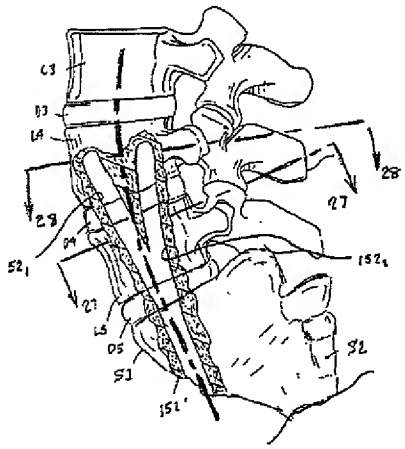
(List continued on next page.)

Primary Examiner—D. Jacob Davis
(74) *Attorney, Agent, or Firm*—Knobbe, Martens, Olson & Bear, LLP.

(57) **ABSTRACT**

One or more curved axial bore is formed commencing from an anterior or posterior sacral target point and cephalad through vertebral bodies in general alignment with a visualized, trans-sacral axial instrumentation/fusion (TASIF) line in a minimally invasive, low trauma, manner. An anterior axial instrumentation/fusion line (AAIFL) or a posterior axial instrumentation/fusion line (PAIFL) that extends from the anterior or posterior target point, respectively, in the cephalad direction following the spinal curvature through one or more vertebral body is visualized by radiographic or fluoroscopic equipment. Generally curved anterior or posterior TASIF axial bores are formed in axial or parallel or diverging alignment with the visualized AAIFL or PAIFL, respectively. The anterior and posterior TASIF axial bore forming tools can be manipulated from proximal portions thereof to adjust the curvature of the anterior or posterior TASIF axial bores as they are formed in the cephalad direction. The boring angle of the distally disposed boring member or drill bit can be adjusted such that selected sections of the generally curved anterior or posterior TASIF axial bores can be made straight or relatively straight, and other sections thereof can be made curved to optimally traverse vertebral bodies and intervening disc, if present.

15 Claims, 18 Drawing Sheets



US-PAT-NO: 6790210

DOCUMENT-IDENTIFIER: US 6790210 B1

TITLE: Methods and apparatus for forming curved axial bores through spinal vertebrae

---------- KWIC ----------

Detailed Description Text - DETX (29):

Slight but abrupt angular changes in the overall curvature of the anterior TASIF axial **bore 152 are made within the vertebral** bodies of L5 and L4 as shown in FIGS. 15 and 16, by caudal retraction of the outer sheath 40 and cephalad advancement of inner sheath 34. It is expected that it will usually be easier to **adjust the angle of the drill** bit 20 within the spongy **bone** interior to the **vertebral** bodies than in the disc space or while boring through the harder exterior **vertebral bone**. Therefore, after the spongy interior **bone** is bored through, the outer sheath 40 is advanced in the distal direction to straighten the **angle of advancement of the drill** bit 20 through the harder **vertebral bone** on either side of the disc. This straightened boring **angle of attack is shown in FIG. 17, for example, where the drill** bit 20 is advanced across the opposed faces of **vertebral** bodies L4 and L5 with the outer sheath 40 fully advanced in the cephalad direction. This process results in short relatively straight sections separated by more curved sections of the of the anterior TASIF axial bore 152. Thus, the resulting anterior TASIF axial bore 152 shown in FIG. 18 exhibits an overall curvature tracking the **spinal** curvature and the visualized AAIFL, but the curve radius varies, showing a shorter radius within the central portions of **vertebral** bodies L5 and L4.

United States Patent [19]

Romano

[11] **Patent Number: 4,941,466**

[45] **Date of Patent: Jul. 17, 1990**

[54] **CURVED BORE DRILLING METHOD AND APPARATUS**

[76] Inventor: **Jack W. Romano**, 412 NE. 165th, Apt. #13, Seattle, Wash. 98155

[21] Appl. No.: **196,319**

[22] Filed: **May 20, 1988**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 37,697, Apr. 13, 1987, abandoned.

[51] **Int. Cl.**[5] **A61B 17/16**

[52] **U.S. Cl.** **606/80**; 408/127; 408/146; 408/187; 606/96; 606/180

[58] **Field of Search** ..... 128/92 V, 92 VD, 92 R, 128/92 YD, 92 VK, 92 VJ, 303 R, 305; 175/61.75, 73, 74, 75; 408/1 R, 127, 136, 146, 147, 187, 188; 81/177.6

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,223,938	4/1917	Close	82/1.5
1,698,952	1/1929	Hoover	173/50
1,822,330	9/1931	Ainsle	128/334 R
2,291,413	4/1942	Siebrandt	128/83
2,666,430	1/1954	Gispert	128/83
2,747,384	5/1956	Beam	464/52
2,905,178	9/1959	Hilzinger	128/303 R
3,554,192	1/1971	Isberner	128/83
3,628,522	12/1971	Kate	128/751
3,697,188	10/1972	Pope	408/230
3,815,605	6/1974	Schmidt et al.	128/305
4,257,411	3/1981	Cho	128/92 VD
4,265,231	5/1981	Scheller, Jr. et al.	128/92 VD
4,312,337	1/1982	Donohue	128/92 VD
4,345,601	9/1982	Fukuda	128/339
4,421,112	12/1983	Mains et al.	128/92 VY
4,541,423	9/1985	Barber	128/92 VD
4,590,929	5/1986	Klein	128/92 R
4,622,960	11/1986	Tam	128/92 VK

FOREIGN PATENT DOCUMENTS

1168222 3/1983 U.S.S.R. .

Primary Examiner—Robert A. Hafer

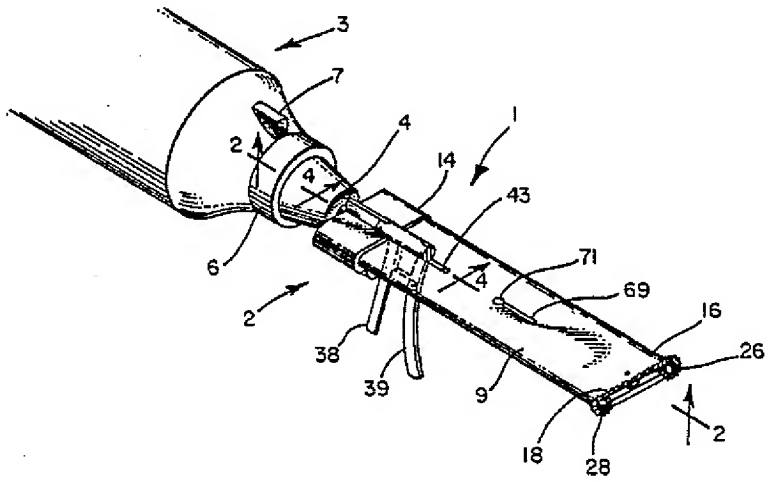
Assistant Examiner—Kevin G. Rooney

Attorney, Agent, or Firm—James R. Vance

[57] **ABSTRACT**

A curved bore hole drilling apparatus and method utilizing two power driven drill shafts equipped with flexible shaft sections on the distal ends thereof with each flexible shaft section having a cutting tip. A semicircular channel shaped drill guide loosely engages each flexible shaft end section and is caused to rotate through an approximate 90° angle as the cutting tips are advanced. The drill guides are pivotally mounted for rotation in substantially the same plane end, when rotated through an approximate 90° angle so as to meet, the cutting tips of the associated rotating flexible drill bits form a curved semicircular bore hole which may extend through 180°. The flexible shaft sections and guides are then backed out of the bore and the bore may be used for attachment of a tie such as a wire or a suture which is passed through the bore. The drilling shafts and flexible shaft sections are mounted in parallel relation within a housing and are advanced toward the surface to be bored in a rectilinear direction normal to the surface to be bored. In a second embodiment the parallel flexible shaft sections are pulled through their arcuate paths by means of the channel shaped drill guides which are rotated by means of worm and pinion drives under control of the operator. Each flexible shaft section has a slotted connection with its associated power driven shaft and is advance by the drill guides against spring pressure. As the drill guides are backed out of the bore the flexible shaft sections are returned under spring pressure. Still another embodiment utilizes a channel shaped drill guide of approximately 180° circumference which is caused to rotate through 180° to form the bore hole into and out of the bone surface. In this embodiment, the drill and guide housing is located within an anchoring sleeve which resists the unbalanced drilling forces tending to laterally shift the drill shaft housing. The use of 180° arcuate drill guide and the anchoring sleeve enable the bore hole to be formed in a joint cavity using arthroscopic surgical techniques.

36 Claims, 5 Drawing Sheets



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TITLE: Curved bore drilling method and apparatus

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Parent Case Text - PCTX (9):

The present invention provides method and apparatus whereby a flexible drill shaft may be caused to enter the surface of a **bone** or other hard material in a first approach direction normal or at a given angle to the surface of the material and to then be guided through a second curvilinear path having a predetermined degree of curvature. With this method it is unnecessary to alter the **angle of approach of the drill** shaft during the procedure making it possible to drill a **bone** surface for instance through a very small and deep incision. The method further contemplates bore drilling in connection with arthroscopic surgery. Thus, in one form of the apparatus, a single arcuate drill guide of approximately 180.degree. circumference is first set in position so as to be insertable through an anchoring sleeve located in an extremely small incision giving access to a joint cavity. Once located **within the cavity,** the 180.degree. arcuate guide is returned to a start position and the flexible drill shaft is guided through an approximate 180.degree. curvature bore hole, into-and-out-of the **bone** surface. The drill and guide are then backed out of the hole, and the drill guide member is returned to the initial approach position and drawn back through the anchoring sleeve or withdrawn with the sleeve from the joint cavity.